Citect for Windows
Driver Specification Extract
MELSCQNA Driver

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Contents

1. TARGET DEVICE(S) AND PROTOCOL 4

1.1 Introduction 4

1.2 Device Manufacturer 4

1.3 Device Definition 4

1.4 Communications Method 4

1.5 Communications/Hardware Configuration 4

1.5.1 Wiring Diagrams 4

1.5.2 I/O Device Settings 5

1.5.3 Software Setup 5

1.6 Special Requirements 5

1.7 Maximum Request Length 6

2. USER INTERFACE 7

2.1 Introduction 7

2.2 Driver Name 7

2.3 Boards Form 7

2.3.1 Board Type 7

2.3.2 Address 7

2.3.3 IO Port 7

2.3.4 Interrupt 7

2.3.5 Special Opt 7

2.4 Ports Form 7

2.4.1 Baud Rate 7

2.4.2 Data Bits 7

2.4.3 Stop Bits 7

2.4.4 Parity 7

2.4.5 Special Opt 7

2.5 IO Devices Form 8

2.5.1 Protocol 8

2.5.2 Address 8

2.6 Pull-down lists Help 8

2.7 IO Device Variable Types 9

2.7.1 Formats and types 9

Citect data types 9

2.7.2 MELSCQNA.DBF Entries 9

2.8 PROTDIR.DBF 10
2.9 Parameters and INI options 10
2.9.1 Standard Parameters 10
2.9.2 Driver Specific Parameters 10
2.10 Remapping 10
2.11 Driver Specific Errors 10
2.12 Driver Error Help 11
2.13 Debug Messages 11
2.14 Stats Special Counters 12
2.15 Hints and Tips 12

3. REFERENCES 13
3.1 References 13

4. APPENDIX A 14
4.1 AJ71QE71(B5), A1SJ71QE71-B2 and A1SJ71QE71-B5 Hardware. 14

1. Target Device(s) and Protocol

1.1 Introduction

This section defines the types of I/O Devices that are targeted by this driver.

1.2 Device Manufacturer

Mitsubishi Electric

1.3 Device Definition

Melsec-QnA Ethernet interface module type AJ71QE71. This interface module provides communication with Melsec-QnA PLCs via Ethernet. The Melsec-QnA driver can connect with up to 8 TCP/IP channels per AJ71QE71 interface module. One channel (port) is used for communication with a primary Melsec-QnA PLC; the other ports can then be used for setting up additional Ethernet communication links to remote I/O modules. Besides that, the primary Melsec-QnA PLC is also able to communicate with other PLC CPUs via a MELSECNET network (MELSECNET/10, MELSECNET(II) or MELSECNET/B) connected to the primary PLC. The limit of 8 channels per Ethernet AJ71QE71 interface module is a is set by the amount of fixed buffers on this module. The driver itself has an upper limit of 32 communication channels; this is a driver setting which can be changed if the need arises.
The Melsec-QnA driver also communicates with AJ71QE71-B5, A1SJ71QE71-B2 and A1SJ71QE71-B5 Ethernet interface modules.

1.4 Communications Method

10BASE5 or 10BASE2 Ethernet cable.

1.5 Communications/Hardware Configuration

1.5.1 Wiring Diagrams

The following functional/layout diagrams illustrates the connection between Citect and the Melsec-QnA Ethernet interface module type AJ71QE71. In these configurations, the primary QnA Series PLC itself is connected to a MELSECTNET/10 network. *The nodes which are marked as remote can be occupied by a Citect Workstation.*

Figure 3.5.1.1 : Connection Diagram Using 10BASE5 (Ethernet)

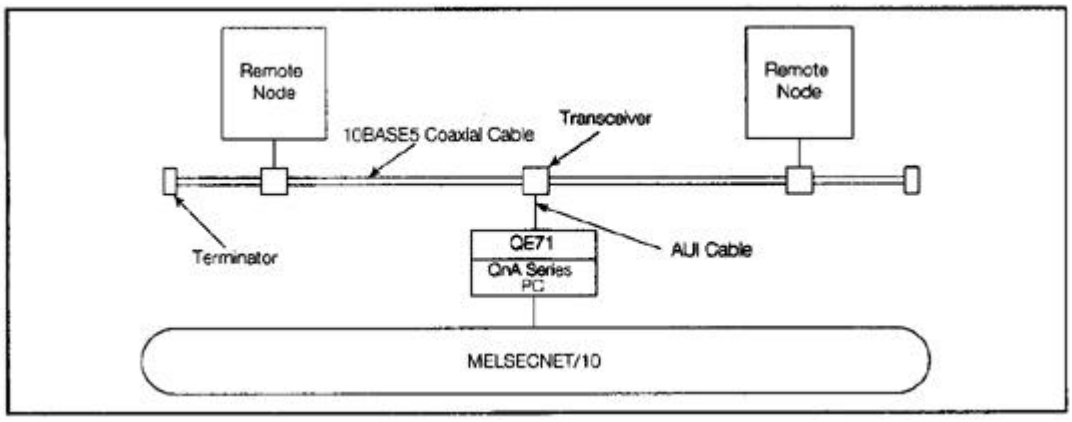
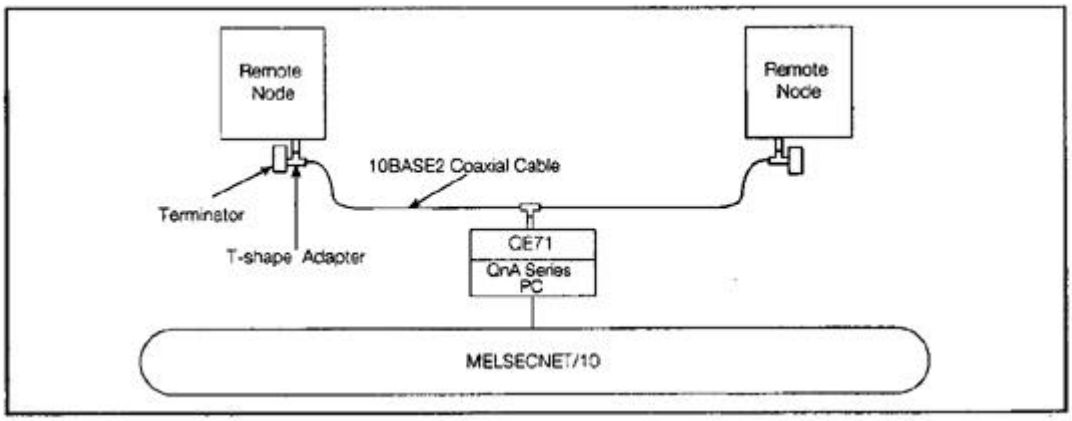


Figure 3.5.1.2 : Connection Diagram Using 10BASE2 (Cheapernet)



1.5.2 I/O Device Settings

Concerning data exchange, the driver will support both Binary Mode (SW2 on front panel of AJ71QE71 OFF) and ASCII Mode (SW2 on front panel of AJ71QE71 ON).
Normally SW1 and SW8 will be OFF, while SW3 and SW7 will be ON. SW4-6 are not used.

Important information for using Citect. For Detailed information see Appendix A.

SW1 – OFF
SW2 – OFF(ON)
SW3 – OFF
SW7 – ON
SW8 – OFF

Mode = 0

SW1 is TCP timeout control.

SW2 is Communications type.
Mitsubishi Programming software MMPlus needs this to be set to ASCII Mode (ON).
Citect normally uses Binary Mode (OFF), but a parameter should allow the selection of ASCII Mode (ON).

SW3 is Self start enabling/disabling of PLC. OFF = Self start Disabled, ON = Self start Enabled.

SW7 is Write Protecting the PLC. OFF = Writing Prohibited, ON = Writing Approved.

SW8 is Initial timing setting of PLC. OFF = Quick start, ON = Normal start (start after a delay of 20 seconds).

1.5.3 Software Setup

The PLC must be programmed to operate the AJ71QE71 interface. A sample program will be given in Appendix A at a later stage in the testing phase of the driver.

1.6 Special Requirements

None

1.7 Maximum Request Length

2048 bits (256 bytes)

2. User Interface

2.1 Introduction

This section defines how the user will see the driver. This relates directly to how the Citect forms need to be filled out and any special INI options. For the kernel, the debug trace messages and the Stats.Special counters are documented.

2.2 Driver Name

MELSCQNA

2.3 Boards Form

2.3.1 Board Type

TCPIP

2.3.2 Address

0

2.3.3 IO Port

Leave blank

2.3.4 Interrupt

None

2.3.5 Special Opt

Leave blank, not used, was previously used as the ACPU time out in milliseconds in form -time (default -t2500)

2.4 Ports Form

2.4.1 Baud Rate

This field is not used

2.4.2 Data Bits

This field is not used

2.4.3 Stop Bits

This field is not used

2.4.4 Parity

This field is not used

2.4.5 Special Opt

The AJ71QE71 Ethernet module's TCP/IP address and port number in the form:

-Ia,b,c,d -Pp -T

Where:

a.b.c.d	is the destination IP address using decimal numbers,
n	is the destination port number in decimal,
-T	forces the TCPIP driver to use TCP not UDP.

Previously the format for the address was a.b.c.d:port, eg. 192.9.2.50:1280

2.5 IO Devices Form

2.5.1 Protocol

MELSCQNA

2.5.2 Address

The CPU number (0-64 or 255. You can specify the CPU monitoring time using the optional parameter /Tt after the CPU number. It should be possible to specify the network number (0-239 or 255) by using optional parameter /Nn after the CPU number (only useful for MELSECNET/10 PLC networks). Finally we need to have the ability to specify the ASCII Mode for data exchange by using optional parameter /A (the default is Binary Mode).

The address format is:

a [/Tt] [/Nn] [/A]

Where:

a	CPU number 0 to 64 or 255 in decimal
t	CPU monitoring time parameter (units 250 ms.). The default is 10.
n	Network number 0 to 239 or 255 in decimal. The default network number is 0.

NOTE :

- An in-depth description of the Network and CPU numbering policy can be found in section 10.1 of the QnA Ethernet Interface Module User's Manual (see 8. References and Contacts).

2.6 Pull-down lists Help

The following entries should be included in the Citect HELP.DBF spec file.

TYPE	DATA	FILTER
PROTOCOL	**MELSCQNA**	

2.7 IO Device Variable Types

2.7.1 Formats and types

IO Device Type	Citect data format	Citect data types	Description/ Special Usage/ Limitations/ Valid Ranges[1]
Input relay	X<hexno>	DIGITAL	Read/Write
Output relay	Y<hexno>	DIGITAL	Read/Write
Link input	DX<hexno>	DIGITAL	Read/Write
Link output	DY<hexno>	DIGITAL	Read/Write
Internal relay	M<no>	DIGITAL	Read/Write
Link relay	B<hexno>	DIGITAL	Read/Write
Latch relay	L<no>	DIGITAL	Read/Write
Annunciator	F<no>	DIGITAL	Read/Write
Edge relay	V<no>	DIGITAL	Read/Write
Step relay	S<no>	DIGITAL	Read/Write
Special relay	SM<no>	DIGITAL	Read/Write
Special relay for link	SB<hexno>	DIGITAL	Read/Write
Timer (Contact)	TS<no>	DIGITAL	Read/Write
Timer (Coil)	TC<no>	DIGITAL	Read/Write
Integrat. timer (Contact)	SS<no>	DIGITAL	Read/Write
Integrat. timer (Coil)	SC<no>	DIGITAL	Read/Write
Counter (Contact)	CS<no>	DIGITAL	Read/Write
Counter (Coil)	CC<no>	DIGITAL	Read/Write
Timer (Current value)	TN<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Integrat. timer (Current value)	SN<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Counter (Current value)	CN<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Data register	D<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Link register	W<hexno>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Special register for link	SW<hexno>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Special register	SD<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
File register (block access)	R<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
File register (seq. access)	ZR<hexno>	INT, BCD, LONG, LONGBCD, STRING	Read/Write
Index register	Z<no>	INT, BCD, LONG, LONGBCD, STRING	Read/Write

Where : <no> decimal number
<hexno> hexadecimal number

2.7.2 MELSCQNA.DBF Entries

TEMPLATE	UNIT_TYPE	RAW_TYPE	BIT_WIDTH	LOW	HIGH	COMMENT
X%X	0	0	1	0	0x1FFF	Input relay
Y%X	1	0	1	0	0x1FFF	Output relay
DX%X	2	0	1	0	0x1FFF	Link input
DY%X	3	0	1	0	0x1FFF	Link output
M%U	4	0	1	0	8191	Internal relay
B%X	5	0	1	0	0x1FFF	Link relay
L%U	6	0	1	0	8191	Latch relay
F%U	7	0	1	0	2047	Annunciator
V%U	8	0	1	0	2047	Edge relay
SM%U	9	0	1	0	2047	Special relay

[1] See table in 4.7 above for allowed range of addresses in commands.

SB%X	10	0	1	0	0x7FF	Special relay for link
S%U	11	0	1	0	8191	Step relay
TS%U	12	0	1	0	2047	Timer (Contact)
TC%U	13	0	1	0	2047	Timer (Coil)
SS%U	14	0	1	0	2047	Integrating timer (Contact)
SC%U	15	0	1	0	2047	Integrating timer (Coil)
CS%U	16	0	1	0	1023	Counter (Contact)
CC%U	17	0	1	0	1023	Counter (Coil)
TN%U	18	1	16	0	2047	Timer (Current value)
SN%U	19	1	16	0	2047	Integrating timer (Current value)
CN%U	20	1	16	0	1023	Counter (Current value)
D%U	21	1	16	0	12287	Data register
W%X	22	1	16	0	0x1FFF	Link register
SW%X	23	1	16	0	0x7FF	Special register for link
SD%U	24	1	16	0	2047	Special register
R%U	25	1	16	0	32767	File register (block access)
ZR%X	26	1	16	0	0xFE7FF	File register (seq. access)
Z%U	27	1	16	0	15	Index register

2.8 PROTDIR.DBF

TAG	FILE	BIT_BLOCK	MAX_LENGTH	OPTIONS
MELSCQNA	MELSCQNA	2048	2048	0x33f

2.9 Parameters and INI options

2.9.1 Standard Parameters

Block 256
Delay 0 (should be increased to lower CPU load)
MaxPending 2
Polltime 0
Timeout 2000 msec (= 2 sec. / Mitsubishi recommends a default value of 10 sec.)
Retry 2 (Mitsubishi recommends a default value of 3)
WatchTime 30 sec

2.9.2 Driver Specific Parameters

None.

2.10 Remapping

Not supported.

2.11 Driver Specific Errors

Driver Error Code (Hexadecimal)	Mapped to (Generic Error label)	Meaning of Error Code
10000h + code		Code is the Error Code. Consult section 17.1.3 of the QnA Ethernet Interface Module User's Manual (see 8. References and Contacts) for details on the Error Code.

2.12 Driver Error Help

The following entries should be included in the Citect PROTERR.DBF spec file.

PROTOCOL	MASK	ERROR	MESSAGE	REFERENCE	ACTION	COMMENT
MELSCQNA	**0FFFF**	**10000**	***MELSCQNA Error Code**	**Section 17.1.3 of the QnA Ethernet Interface Module User's Manual.**		

2.13 Debug Messages

The driver will incorporate trace functionality to allow support and advanced users to assess their own syslog traces for the protocol. The trace information will be communicated to Citect by means of parameters to the channel debug function (as described in Chapter 7. of the DDK V2.0). The following actions can be traced if the focused communication channel is placed into the appropriate debug mode.

- writing data

  Driver calls *debug()* with :
  title parameter : "Transmit"
  buffer parameter : pointer to the channel request buffer
  length parameter : the request length

- reading data

  Driver calls *debug()* with :
  title parameter : "Receive"
  buffer parameter : pointer to the channel response buffer
  length parameter : the response length

- communication errors

  a. In case of general communication errors :

  Driver first calls *debug()* with :
  title parameter : "ERROR: Transmit"
  buffer parameter : pointer to the channel request buffer
  length parameter : the request length

  Then, driver calls *debug()* with :
  title parameter : "Receive"
  buffer parameter : pointer to the channel response buffer
  length parameter : the response length

  b. For timeout errors :

  Driver first calls *debug()* with :
  title parameter : "ERROR: Transmit"
  buffer parameter : pointer to the channel request buffer
  length parameter : the request length

Then, driver calls *debug()* with :
title parameter : “Timeout”
buffer parameter : pointer to the channel response buffer (dummy)
length parameter : the response length (dummy)

2.14 Stats Special Counters

Number	Label	Purpose/Meaning of this counter
0	**DCBs to inqueue**	**Number of messages transmitted.**
1		

2.15 Hints and Tips

3. References

3.1 References

DRIVER DEVELOPMENT KIT V2.0, February 1996, Edition for Citect Windows, Ci Technologies Pty. Limited.

MELSEC Q series Programmable Controller User's Manual – QnA Ethernet Interface Module type AJ71QE71(B5) – A1SJ71QE71-B2 – A1SJ71QE71-B5. Manual number IB (NA) 66661-C

4. Appendix A

4.1 AJ71QE71(B5), A1SJ71QE71-B2 and A1SJ71QE71-B5 Hardware.

The B2 has a Coax connector for 10Base2 and the B5 has an AUI connector for 10Base5 type connections. Mitsubishi recommend using a Transceiver with SQETEST or Heartbeat functionality if using the B5 model.

Indicators on the front of the Module

RUN	ON = Normal, OFF = Bad Thing (Normal Operation Display)
RDY	Flashing = On-Line and Good (Standard Display of communication exchange completion)
BSY	ON = Executing, OFF= Not Executing (Display during execution of communication exchange processing)
SW ERR	CPU error, CPU type error, or rotary switch error display ON = Error, OFF= Normal
COM ERR	ON = Communication Exchange Abnormality (Bad Thing)
CPU R/W	ON = Exchanging data with CPU
TRAN.S	ON = Data link command request executing
TRAN.R	ON = Data link RECV command request waiting
FTP	ON = FTP server function operating
B1 – B8	Communication line connection status ON = Open completed, OFF= Closed state
TEST	ON = Self diagnosis executing
TEST.ERR	ON = Error during self diagnosis

Operation Mode Switch

0 = On – Line
1 = Off – Line
2 = Execute a self diagnosis test using a self-loopback test
3 = Execute a RAM Test
4 = Execute a ROM Test
4 = Execute an EEPROM Test
6 – F Not Used

Communication Exchange condition setting Switches

SW1 = TCP Timeout error temporary circuit process selection.
Selection of Circuit processing t the time of a transmission of a TCP time out error.
OFF = Close the circuit
ON = Do Not Close the Circuit
For Citect keep it OFF

SW2 = Data Code Selection
Type of Data Communications
OFF= Binary Mode
ON = ASCII Mode
Mitsubishi has released a Windows version of their programming software that uses ASCII Mode for communicating with the Module.
Citect normally uses Binary Mode, but there should be an ability to use the ASCII Mode as well.
SW3 = Self start mode setting

Selects the start mode when the QE71 is booted.
OFF= Runs following Y19 (initial processing request signal)
ON = Reads the parameters in the EEPROM buffer memory regardless of the Y19 (initial processing request signal) after power has been turned on or the module reset and then conducts initial processing of the contents.
This switch should be OFF.

SW4-SW6 = Usage not possible (Fixed to OFF)

SW7 = CPU communications exchange timing setting
Write Protect the PLC.
OFF = Writing Prohibited
ON = Writing allowed.
If you want to write to the PLC then make sure this is ON

SW8 = Initial Timing Setting
Select the Timing which starts Initial Processing.
OFF= Quick Start (Start without Delay) when entirely constructed in a single network.
OFF = Normal Start (start after a 20 sec delay) when entirely constructed in multiple networks.
So far OFF has always worked for Citect.